J. Agric. Sci. Mansoura Univ., 31 (6): 3357 - 3373, 2006

EFFECT OF BROILER PARENT STOK STRAIN AND AGE ON REPRODUCTIVE PARAMETERS AND BROILER PRODUCTIVE PERFORMANCE.

Ali, R .M. M .
Animal production Res. Inst. Agric. Res. Center, Ministry of Agric. Egypt

ABSTRACT

Four hundred eggs produced at 32 or 40 weeks of age were hatched from each Hubberd (H) and Ross (R) strain in the same incubator. During different intervals of hatching period, fertility% (FR) and embryonic mortality% (EM) were recorded and hatchability% (H) was computed. After hatch, all chicks were reared under similar management conditions. At 7 wk of age, 10 birds from each strain and at each age of breeder were slaughtered to evaluate carcass yield traits. Economic feed efficiency% (EFE) was calculated. Results revealed that overall means of egg weight (54.94 vs. 56.68 g), FR% (91.75 vs. 94.3%) and H% (80.65 vs. 84.6%) were higher (P<0.01) for H than R strain. Overall mean of egg weight was higher (P<0.01) at 40 than 32 wk of breeder age (53.72 vs. 57.9 g). FR% and H% were higher (P<0.01) for eggs produced at 32 than 40 wk (92.5 and 81.86% vs. 92.5 and 83.39%, respectively). EM% at 0-7, 18-21 and 0-21 d of incubation were higher (P<0.01) in R (5.17, 4.63 and 19.36%) than in H (3.71, 3.45 and 15.39%), respectively. EM% at 7-14 and 14-18 d as well as total abnormality% were not affected significantly by strain. EM% at 0-7 and 0-21 d of incubation were higher (P<0.01) for eggs produced at 32 (16.61 and 5.36%) than at 40 wk of age (18.14 and 3.53%), respectively. EM% during 7-14, 14-18 and 18-21 d as well as total abnormality% did not differ significantly between ages. At hatch (P<0.01), 2, 4, 6 and 7 (P<0.01) wk of age, chick weight was heavier in H than R. At hatch (43.45 vs. 45.98 g, P<0.01), 2, 4, 6 (P<0.01) and 7 (P<0.01) wk of age, chicks were heavier when were hatched from eggs produced at 40 than 32 wk of age. Average total weight gain (ATG) and relative growth rate (RGR) of chicks at 0-4 wk were not affected by strain. However, ATG at 4-7 and 0-7 wk of age as well as RGR at 4-7 wk were higher (P<0.01) for H than R strain. ATG at 4-7 and 0-7 wk and RGR at 4-7 wk of age were affected (P<0.01) by age of breeders. Average feed intake (AFI) at all intervals increased in R than H strain. Feed conversion was better (P<0.05) in chicks of H strain at all age intervals. AFI at all age intervals were higher for chicks hatched from eggs produced at 32 than 40 wk. Values of feed conversion did not differ significantly. Viability% at 0-4, 4-7 (90.26 vs. 91.32%, P<0.01) and 0-7 wk of age was slightly higher in H than R strain. Viability% at 0-4 wk was higher in chicks hatched from eggs produced at 40 than 32 wk of age (90.06 vs. 90.43%). Weights of eviscerated bird, edible giblets and dressing were heavier in chicks of H than R strain. Their weight relative to live body weight was higher in H than R (72.28, 7.13 and 79.40%, respectively). Weight of non-edible components was not affected significantly by strain. Their weight relative live body weight was nearly similar in H (4.52 and 6.25 %, respectively) than in R (4.88 and 6.44 %, respectively). Weight of carcass, edible giblets and dressing as well as non-edible weight were insignificantly heavier in chicks hatched from eggs produced at 32 than 40 wk of age. Their weight relative to live body weight was nearly similar. From the economic point of view, it was found that chicks of H strain hatched from eggs produced at 40 weeks of age recorded the highest economic feed efficiency (217.24%).

keywords: Hubber, Ross, egg weight, fertility, mortality, hatchability, gain, carcass

INTRODUCTION

Live body Weight, fertility, embryonic mortality and hatchability of eggs are considered important reproductive traits in poultry production. Several investigations have been proved significant breed differences in egg weight (Proudfoot *et al.*, 1982), fertility percentage (Wiley, 1950), hatch weight (Cahaner *et al.*, 1986 and Suarez *et al.*, 1997), body weight at 4 and 7 weeks of age (Proudfoot and Hulan, 1987 and Merkley and lowe, 1988), average weight gain (Ulaganathan *et al.*, 1982 and Alsobayel *et al.*, 1985), growth rate (Marks, 1980 and Proudfoot *et al.*, 1982), feed consumption (Marks, 1980) and feed conversion ratio (Malone and Chaloupka, 1979). Breed differences were also reported in eviscerated carcass weight and carcass yield (Keshri *et al*, 1982), dressed carcass weight (Pandey, *et al.*, 1985; Merkley and Lowe, 1988), and weight of giblets (El-Attar and El-Zeiny, 1983 and Mahapatra *et al.*, 1984).

On the other hand, no significant differences were found in mortality percentage between the different genotypes at 4 weeks of age (Malone and Chaloupka, 1979; Proudfoot *et al.*, 1982 and Alsobayel *et al.*, 1989).

Hen age significantly affect egg weight (Yannakopoulos and Tserveni-Gousi, 1987 and Suarez *et al.*, 1997). Alsobayel (1990) and Suarez *et al.* (1997) reported that fertile hatchability percentage significantly decreased with increasing breeder age. McDaniel *et al.* (1979) and Alsobayel (1990) found a definite relationship between embryonic mortality during the first 7 days of incubation with age of breeder. Hen age had highly significant effect on hatch weight (Spratt and Leeson, 1987; Yannakopoulos and Tserveni-Gousi, 1987). Daily gain (Alsobayel *et al.*, 1989) and feed consumption (Alsobayel *et al.*, 1989) increased, while feed efficiency decreased (Wiley, 1950) with increasing age of bird.

It was found that age had significant effect on carcass weight (Chen *et al.*, 1987 and Alsobayel *et al.*, 1989), gizzard percentage and percentage of eviscerated weight (Ehinger, 1982) and giblets and viscera weights (Ehinger, 1982 and Keshr *et al.*, 1985). However, Horn et al. (1980) found that age of Hen had no significant effect on mortality percent.

This study was conducted to determine the strain effect of broiler parent stock and hen age on some reproductive traits (egg weight, fertility rate, as well as percentages of embryonic mortality and hatchability of fertile eggs). Also, some productive traits (Live weights, feed conversion, viability, carcass weight and percentage) were measured .

MATERIALS AND METHODS

The current study was carried out at the poultry farm production under supervision, Department of Poultry Production, El-Gimmizah Research Station, Gharbia governorate, belonging to Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture. during the period from December 2005 and April 2006 .

Populations:

The hatching eggs used in this study were obtained from two strains of broiler parent stocks raised in Egypt, Ross from AL Wadi Farm and

Hubbard from Cairo Company. Eight hundred eggs produced at 32 or 40 weeks of age were taken from both strains (400 eggs each). Eggs were set in the same incubator from 21 December 2005 until 12 January 2006., At 18 days of incubation, each egg was separated in a plastic punctured bag in order to relate chick weight to egg weight. During the hatching period, percentages of infertile eggs and embryonic mortality were recorded between 0–7 days (M1), 7–14 days (M2), 14–18 days (M3) and 18 – 21 days (M4) by judging from the size and condition of the dead embryo. Hatchability rate was computed on basis of good chicks relative to number of fertile eggs. Temperature and relative humidity were recorded daily, being 37.8 and 60% ,respectively during the 1st 18 days of hatching period.

Chicks brooding, rearing and management:

Two hatches were secured from 21 December 2005 and 12 January 2006 at 32 and 40 weeks of age. After hatch, the obtained chicks were wing banded. All chicks were reared on the flood under similar managerial conditions. Brooding houses were fumigated and temperature was adjusted at 34 to 35 °C during the first two days, then it was decreased 3°C weekly, reaching 25 °C at 23 days of age. Chicks were vaccinated against Newcastle and Gumboro diseases for 7 and 14 days intervals up to the 3 and 7 weeks, respectively.

Feeding system and rations:

The diets were formulated to cover the requirments of chicks (NRC, 1994). Ingredients and chemical composition of starter and finisher rations used in feeding breeders and chickens are shown in Tables (1). Feeding period of chicks lasted for 7 weeks, 4 weeks on starter diet and 3 weeks on finisher diets.

Table (1): Composition and chemical analysis (colculated) of starter and finisher rations used in feeding breeders and chickens.

Ingredients (%)	Starter diet (0 – 4 wk)	Finisher diet (4 – 7 wk)
Yellow corn	58	62
Soybean meal (44 %)	29	24
Protein concentrate (52 %)	10	10
Vegetable oil	3	4
Total	100	100
Chemical analysis		
Nutrient	**Starter diet**	**Finisher diet**
Crude protein, %	23.06	21.22
Crude fat, %	3.00	4.00
Crude fiber, %	3.00	3.00
Calcium, %	0.99	0.97
Phosphorus, %	0.50	0.49
Salt, %	0.35	0.35
Sodium%	0.22	0.22
Lysine%	1.28	1.15
Methionine + Cystine%	0.80	0.74
ME, k cal / kg	3077	3200

* Broiler concentrate contain : ME(Kcal/Kg) 2200, crude protein 52% , crude fiber0.77%: crude fat 5.82% : calcium 8.90% : phosphorus available 3.60% : lysine 2.93% and methionine & cystine 2.05%.

** Colculated on dry mater basis and according to NRC (1994).

Parameters estimated and data collection:

Embryonic mortality and hatchability percentage:

On the ninth day of incubation, the eggs were candled and all the infertile eggs were recorded, then the fertility percentage was calculated as following:

***Fertility rate** = (Number of fertile eggs/ total number of eggs) x100.*

On the 18th day of incubation, eggs were candled and all eggs showing no evidence of alive embryo were removed to determine percentage of embryonic mortality.

***Embryonic Mortality (%)** = (Number of dead embryos/number of fertile eggs) x100.*

Hatchability percentage was calculated withe the following formula:

***Hatchability (%)** = (Number of healthy hatched chicks/number of fertile eggs) x100*

Live body weight, weight gain and relative growth rate:

Live body weight of chicks was individually recorded at hatch and then at 4 and 7 weeks of age. Average weight gain was calculated at the same previous intervals. However, relative growth rate was computed according the following formula:

***Relative growth rate (%)** = {w2-w1/(w2 + w1)/2} x100.*

Where:

W1 = body weight at certain age.

W2 = body weight after certain period.

Feed consumed by all chicks was weekly recorded, and then it was averaged and expressed at all age intervals. Feed conversion (FC) was calculated according to the following formula:

FC = Feed consumption (g)/weight gain (g).

Carcass traits:

At 7 weeks of ages, ten birds were randomly chosen from each strain and at each age of breeder (total number of 40 birds) to evaluate carcass yield traits. Birds were deprived from food, but not from water, for about 24 hours before slaughter. Birds were weighted before slaughter to obtain live body weight. Slaughter was performed by cutting the gullet and jugular veins between the first and second cervical vertebra without separating the head from the body. Each bird was reweighed after the complete bleeding to detect blood weight. Feathers were removed using a mechanical picking after scalding the birds and reweighed to calculate feathers weight. Edible giblets of every bird including heart, liver and gizzard were weighed together to obtain edible ovals weight. Eviscerated weight of each bird was recorded and then edible ovals weight was added to eviscerate weight to obtain dressing percentage.

Economic efficiency (E E %):

Economic feed efficiency (EFE%) was calculated as the following:

EE% = {Total return (L.E)/Total cost (L.E)} x 100

Statistical Analysis:

Data were analysis using least square and maximum likelihood program of (SPSS, 1997)

RESULTS AND DISCUSSION

Egg weight, fertility rate and hatchability percentage:

Effect of strain:

Data in table (3) show that overall mean of egg weight was significantly (P<0.01) higher in Hubberd (H, 56.68 g) than in Ross (R, 54.94 g). These results agreed with those obtained by (Mahmoud *et al.*, 1974 a, b & e; Negm *et al.*, 1978; Mahmoud *et al.*, 1980; Eid, 1979; Shebl, 1980 and Mahmoud et al, 1981). A significant (P<0.01) increase in fertility rate (94.3%) and hatchability percentage (84.6%) was also recorded for Hubbard strain as compared to that of Ross (91.75 and 80.65%, respectively). It was found that hatchability percentage significantly decreased with decreasing egg weight in Ross strain (McNaughton *et al.*, (1978). These results agreed with those obtained by Breslavets *et al.* (1997); Suarez *et al.* (1997) and Mt- Losevic *et al.* (1997), who found significant differences in fertility rate between strains.

Effect of breeder age:

As affected by age, overall mean of egg weight was significantly (P<0.01) higher at 40 than 32 weeks of age (53.72 vs. 57.9 g). Similar trend of increase was also reported in egg weight by increasing age of pullets from 40 weeks to 72 weeks (Gunninghame *et al.*, 1960), from 36 weeks to 52 (Goher *et al.*, 1994) and from 42 weeks to 67 weeks (El-wardany *et al.*, 1994). Also, Shanawany (1982) showed a significant (P<0.01) increase in egg weight as the age of hen increased from 28, 32, 36, and 40 up to 44 weeks.

Table (2): Effect of strain and age of broiler breeder on egg weight before hatch, fertility rate and hatchability percentage.

Item	n	Egg weight (g)	Fertility rate (%)	Hatchability (%)
Effect of strain:				
H	377	$56.68^{A} \pm 0.52$	$94.2^{A} \pm 0.09$	$84.60^{A} \pm 0.09$
R	367	$54.94^{B} \pm 0.52$	$91.8^{B} \pm 0.07$	$80.65^{B} \pm 0.06$
Effect of breeder age (week)				
32	374	$53.72^{B} \pm 0.22$	$93.5^{A} \pm 0.09$	$83.39^{A} \pm 0.05$
40	370	$57.90^{A} \pm 0.32$	$92.5^{B} \pm 0.05$	$81.86^{B} \pm 0.08$
Effect of interaction (strain x age):				
32 H	189	54.50 ± 0.16	94.5 ± 0.01	85.70 ± 0.09
40 H	188	58.86 ± 0.32	94.0 ± 0.08	83.50 ± 0.02
32 R	185	52.94 ± 0.20	92.5 ± 0.03	81.08 ± 0.04
40 R	182	56.94 ± 0.45	91.0 ± 0.03	80.22 ± 0.09

A and B: Means denoted within the same column with different superscripts for strain or age effect are significantly different at (P<0.01).

Fertility rate and hatchability percentage were significantly higher for eggs produced at 32 than 40 wk of age (92.5 and 81.86% vs. 93.5 and 83.39%, respectively). Alsobayel (1990) and Suarez *et al.* (1997) reported that fertility and hatchability were significantly decreased with increasing breeder age. In agreement with the present trend, Aisobayel (1990) found highly significant effect of dam age on fertility rate. Also, several authors found significant differences in hatchability percentage as affected by age of pullets (Susan *et al.*, 1979; Breslavets *et al.*, 1997; Suarez *et al.*, 1997 and Milosevic *et al.*, 1997). In this respect, Christensen *et al.* (1979) found that fertility rate and hatchability percentage were significantly higher (94.2 and 83.4%, respectively) for eggs produced at 41 wk than at 57 wk of age (79.8 and 69.3%, respectively). Also, fertility rate was 99.2 and 97.2 % for eggs produced at 34 and 50 wk of age, respectively (Reis *et al.*, 1997) and 97.03 and 89.43% for eggs produced by 44 and 60 weeks, respectively (Susan *et al.*, 1979). However, Meijerhof (1994) found that hatchability percentages were significantly (P<0.01) higher (91.5%) at 37 wks versus 85.1% at 59 wk of age.

The effect of interaction between age and strain on egg weight, fertility rate and hatchability percentage was not significant.

Embryonic mortality and cull during incubation:

Effect of strain*:*

The effect of strain on embryonic mortality was significantly (P<0.01) only during the interval from 0-7, 18-21 and 0-21 days of incubation period, being higher in Ross (5.17, 4.63 and 19.36%) than in Hubberd (3.71, 3.45 and 15.39%) eggs,
respectively. However, mortality percentage during intervals from 7-14 and 14-18 days as well as total abnormality percentage were not affected significantly by strain (Table 4). These results agreed with those obtained by Suarez *et al.* (1997), who reported significant differences in total embryonic mortality percentages during incubation period among six egg producing strains.

Effect of breeder age:

The effect of dam age on mortality percentage was significant (P<0.01) only during interval from 0-7 and 0-21 days of incubation, being higher for eggs produced at 32 wk (16.61 and 5.36%) than at 40 wk of age (18.14 and 3.53%), respectively. However, mortality percentage during intervals from 7-14, 14-18 and 18-21 days as well as total abnormality percentage did not differ significantly between ages (Table 3). Lapao *et al.* (1999) reported significant (P<0.01) increase in embryonic mortality percentage by increasing age from 42 up to 59 wk (14.8 vs. 27.6%).

In accordance with the present results, McDaniel *et al.* (1979) and Alsobayel (1990) found higher early embryonic mortality rate and lower late mortality rate for eggs produced at older than younger ages. There was a definite relationship between embryonic mortality during the first 7 days of incubation with age of breeder.

The effect of interactions between age and strain on mortality rate and abnormality percentage were not significant.

Table (3): Effect of strain and broiler breeder age on embryonic mortality and cull percentages during incubation period.

Item	Mortality rate (%) Incubation interval (day)						Total mortality (%)
	0-7	7-14	14-18	18-21	cul	0-21	
Effect of strain:							
H	3.71^{B}	1.86	1.86	3.45^{B}	4.52	15.4^{B}	4.52
R	5.17^{A}	2.18	2.46	4.63^{A}	4.92	19.4^{A}	4.92
Effect of breeder age (week):							
32	5.36^{A}	2.41	1.88	4.02	2.95	16.6^{B}	2.95
40	3.53^{B}	1.62	2.44	4.06	6.49	18.1^{A}	6.49
Effect of interaction:							
32 H	4.76	2.12	1.59	3.17	2.65	14.3	2.65
40 H	2.66	1.59	2.13	3.72	6.38	16.5	6.38
32 R	5.95	2.70	2.16	4.86	3.24	18.9	3.24
40 R	4.39	1.65	2.75	4.39	6.59	19.8	6.59

A and B: Means denoted within the same column with different superscripts for strain or age effect are significantly different at (P<0.01).

Live body weight of hatched ckicks:

Effect of strain:

At hatch, chicks weight were significantly affected (P<0.01) by strain, being heavier in H than R (Table 4). This was mainly related to egg weight of each strain before incubation (Table 2). Suarez *et al.* (1997) reported a high positive correlation coefficient (r = 0.969) between egg weight and chick weight at hatch. At 2, 4, 6 and 7 weeks of age, chicks are always heavier for H than R strain. The differences in live body weight of chicks were only significant (P<0.01) at 7 wk of age, being heavier by 10.17% in H than R.

Similar results were found by (Chambers *et al.* (1981); Khalifah *et al.* (1981); Proudfoot and Hulan (1987) and Merkley and Lowe (1988).

Effect of age:

At hatch, chicks hatched from eggs produced at 40 weeks of age were significantly (P<0.01) heavier (45.98 g) than those hatched from eggs produced at 32 weeks (43.45 g). The superiority in chick weight at hatch from eggs produced at 40 weeks than those of 32 weeks of age was about 5.5 % versus 7.8% in egg weight before hatch.

After hatching at 2, 4, 6 and 7 weeks of age, chicks hatched from eggs produced at 40 weeks of age were heavier than those of 32- weeks of age. The differences in live body weight of chicks were only significant (P<0.01) at 6 and 7 weeks of age, being heavier by 3.3 and 10.2% in chicks hatched from eggs produced at 40 than 32 weeks of age (Table 4).

Similar trends were reported by Malon and Chaloupka (1979); Hataba (1980) , Proudfoot *et al.* (1982) and Suarez *et al.* (1997); who found that chick weight was significantly affected by age of breeder producing eggs.

The effect of interaction between age and strain on mortality rate and abnormality percentage was not significant

Table (4): Effect of chicken strain and age of broiler breeder on average live body weight of their chicks during rearing period.

Item	Average live body weight (g) at:				
	Hatch	2 wks X ± S.E	4 wks X ± S.E	6 wks X ± S.E	7 wks X ± S.E
Effect of chicken strain:					
H	$45.6^{A} \pm 0.22$	394.7 ± 3.55	1181.1 ± 9.12	1819.3 ± 26.8	$2176.3^{A} \pm 15.89$
R	$43.9^{B} \pm 0.53$	382.8 ± 3.01	1169.4 ± 9.12	1593.7 ± 22.3	$1955.0^{B} \pm 15.88$
Effect of breeder age (wks):					
32	$43.5^{B} \pm 0.46$	383.6 ± 2.13	1169.4 ± 9.22	$677.6^{B} \pm 12.8$	$1955.0^{B} \pm 15.22$
40	$46.0^{A} \pm 0.16$	394.0 ± 6.03	1181.1 ± 7.85	$735.4^{A} \pm 18.9$	$2176.3^{A} \pm 15.89$
Effect of interaction (agex strain):					
32 H	45.1 ± 0.32	386.5 ± 3.33	1184.0 ± 7.52	1761.5 ± 12.9	2066.9 ± 22.48
40 H	46.1 ± 0.22	403.0 ± 3.20	1178.2 ± 4.25	1877.1 ± 8.90	2285.7 ± 22.48
32 R	41.8 ± 0.45	380.7 ± 2.47	1154.9 ± 9.12	1593.7 ± 26.4	1843.1 ± 22.48
40 R	45.9 ± 0.23	385.0 ± 2.58	1184.0 ± 6.58	1593.7 ± 26.1	2066.9 ± 22.48

A and B: Means denoted within the same column with different superscripts for strain or age effect are significantly different at ($P<0.05$).

Body weight gain:

Effect of strain:

Data in Table (5) show the average total weight gain and relative growth rate of chicks during rearing period. Average total gain and relative growth rate of chicks during the 1st age interval up to 4 wk was not affected by strain. However, average total gain at 4-7 and 0-7 wk of age as well as relative growth rate only at 4-7 wk of rearing period were significantly ($P<0.01$) higher for H than R strain. The significant differences in relative growth rate only between 4-7 wk of age indicated maintenance og chicks in H strain to express their superiority in term of high growth rate during the later intervals of rearing period.

Results concerning total gain agreed with those obtained by Mahmoud (2003), However those regard to relative growth rate agreed with the results of many authors (Leclercq *et al.*, 1980; Marks, 1980; Rizkalla, 1996; Aly 2000 and Mahmoud (2003), who found that the differences in the relative growth rate due to the effect of strain were significant.

Generally, strain differences in growth rate may be attributed to genetic and physiological background of both strains.

Effect of age:

Total weight gain only at age intervals 4-7 and 0-7 wks. and relative growth rate at 4-7 wks. of age were differend significantly ($P<0.01$) according to breeders age (Table 5).

These results agreed with those obtained by Mahmoud (2003), who revealed significant differences ($P<0.01$) in the body weight gain and relative growth rate due to the effect of hen age.

The interactions between strain and age on body weight gain and relative growth rate at 0–4, 4–7 and 0–7 wks of age were not significant.

Table (5): Effect of strain and age of broiler breeder on total gain and relative growth rate of the chicks during the rearing period.

Item	Total weight gain (g)			Relative growth rate (%)		
	Rearing interval (wks)			Rearing interval (week)		
	0 – 4 X ± S.E	4 - 7 X ± S.E	0 –7 X ± S.E	0 - 4 X ± S.E	4 – 7 X ± S.E	0 - 7 X ± S.E
Effect of chicken strain:						
H	1135.5± 8.9	995.2^{A}± 15.4	2130.7^{A}±22.0	185.1±4.2	59.3^{A}±.30	191.8±4.2
R	1125.6± 9.5	785.5^{B}± 18.2	911.1^{B}±20.3	185.5±3.6	50.3^{B}±.32	191.2±4.6
Effect of breeder age (wks):						
32	1126.0± 12.	785.5^{B}± 14.6	911.5^{B}±18.6	185.7±5.4	50.3^{B}±.31	191.3±4.3
40	135.1± 14.1	995.2^{A}± 13.8	2130.3^{A}±15.6	185.0±2.5	59.3^{A}±.22	191.7±3.4
Effect of interaction (agex strain):						
32 H	138.9± 11.3	882.9 ± 9.8	2021.8±17.6	185.3±4.2	54.3±.26	191.5±3.4
40 H	132.1± 14.1	1107.5± 11.3	2239.6±23.5	185.0±4.2	64.0±.26	192.1±4.2
32 R	113.1± 10.9	688.2 ± 10.4	1801.3±18.9	186.0±4.1	45.9±.33	191.1±3.5
40 R	138.1± 11.3	882.9 ± 12.3	2021.0±22.1	185.1±3.4	54.3±.25	191.3±5.2

A and B: Means denoted within the same column with different superscripts for strain or age effect are significantly different at (P<0.01).

Feed consumption and feed conversion:

Effect of strain

Data of feed intake of chicks are presented in Table (6) It is clear that average feed consumption at all rearing intervals (0-4, 4-7 and 0-7 wks) increased in R than H strain, being higher by 20% during the whole rearing period. The obtained trend of strain differences agreed with that reported by several authors (Cherry et al. (1978); Proudfoot *et al.* (1982) and Alsobayel *et al.* (1989). However, the results of Marks (1980) and Yamani *et al.* (1978) contrasted the present trend.

The marked increase in feed intake and decrease in average weight gain of chicks in R as compared to H strain during all rearing intervals reflected better (P<0.05) feed conversion in chicks of H strain at 0-4, 4-7 and 0-7 wk intervals of rearing period, respectively (Table 6). These results agreed with those obtained by (Mohamed 1988 ; Mahmoud 2003; and Aly (2000), who showed significant (P<0.01) differences in feed conversion due to the effect of breed.

Effect of age:

Feed consumption at all rearing intervals (0-4, 4-7 and 0-7 wks) were higher for chicks hatched from eggs produced at 32 wks than 40 wks, being higher by 13% during the whole rearing period (Table 6).

As a result of the opposite situation of average weight gain at both ages, values of feed conversion did not differ significantly, being nearly similar for chicks produced from both egg ages (Table 6).

Strain and age interaction in respect of feed intake and feed conversion during all rearing intervals were not changed as a result of strain and age interaction (Table 6).

Table (6): Effect of strain of chicken and age of broiler breeder on feed consumption (FC) and feed conversion of chicken.

Item	Average feed consumbation			Feed conversion		
	Rearing interval (wks)			Rearing interval (wks)		
	0 – 4 X $\pm$ S.E	4 – 7 X $\pm$ S.E	0 – 7 X $\pm$ S.E	0 – 4 X $\pm$ S.E	4 – 7 X $\pm$ S.E	0 – 7 X $\pm$ S.E
Effect of chicken strain:						
H	1877.6$\pm$21.03	1985.2$\pm$22.3	3862.6$\pm$43.3	1.61$^{b}\pm$0.02	2.55$^{b}\pm$.01	2.06$^{b}\pm$.02
R	2025.5$\pm$18.5	2635.6$\pm$19.0	4661.1$\pm$42.1	1.72$^{a}\pm$0.04	2.68$^{a}\pm$.04	2.30$^{a}\pm$.03
Effect of broiler breeder age: (wks)						
32	2001.8$\pm$20.3	2519.3$\pm$17.9	4521.1$\pm$33.0	1.70$\pm$0.03	2.54$\pm$.05	2.26$\pm$.01
40	1901.3$\pm$17.2	2101.4$\pm$17.9	4002.7$\pm$33.0	1.63$\pm$0.06	2.69$\pm$.05	2.10$\pm$.02
Interaction effect: (agex Strain)						
32 H	1953.6$\pm$15.14	2168.5$\pm$22.3	4122.1$\pm$46.2	1.65$\pm$0.05	2.63$\pm$.02	2.11$\pm$.01
40 H	1801.6$\pm$14.5	1801.6$\pm$18.2	3603.2$\pm$38.2	1.56$\pm$0.04	2.47$\pm$.03	2.00$\pm$.02
R 32	2050.0$\pm$12.8	2870.1$\pm$17.0	4920.1$\pm$44.2	1.74$\pm$0.05	2.61$\pm$.02	2.40$\pm$.02
R40	2001.0$\pm$21.4	2401.2$\pm$15.2	4402.1$\pm$46.6	1.69$\pm$0.03	2.74$\pm$.03	2.20$\pm$.02

a and b: Means denoted within the same column with different superscripts for strain or age effect are significantly different at ($P<0.05$).

Viability percentage:

Effect of strain:

Results in Table (7) indicated that total viability percentage during the whole rearing period was slightly higher in chicks of H than R strain (96.75and 96.00%, respectively). Marked difference between both strains was found during rearing interval from 0 - 4 weeks (97.50vs. 98.00%).

Table (7): Effect of strain of chicken and age of broiler breeder on viability percentage of chicks at different rearing intervals.

Item	Viability percentage at age interval (WK)		
	0 - 4 X $\pm$ S.E	4 - 7 X $\pm$ S.E	0 – 7 X $\pm$ S.E
Effect of strain:			
H	98.00$\pm$ 0.19	98.45$\pm$ 0.20	96.75$\pm$ 0.19
R	97.50$\pm$ 0.20	98.40$\pm$ 0.42	96.00$\pm$ 0.21
Effect of breeder age: (week)			
32	97.25$\pm$ 0.17	98.20$\pm$ 0.39	95.50$\pm$ 0.21
40	98.25$\pm$ 0.21	98.65$\pm$ 0.22	97.25$\pm$ 0.19
Effect of interaction: (Strain x age)			
32 H	97.50$\pm$ 0.32	98.50$\pm$ 0.31	96.00$\pm$ 0.32
40 H	98.50$\pm$ 0.21	98.40$\pm$ 0.20	97.00$\pm$ 0.13
32R	97.00$\pm$ 0.15	97.90$\pm$ 0.31	95.00$\pm$ 0.25
40R	98.00$\pm$ 0.22	98.90$\pm$ 0.42	97.00$\pm$ 0.32

El-Turkey (1981) and Mahmoud (2003) reported that the viability percentage was found to be different according of strain.

Effect of age:

Total viability percentage during the whole rearing period was slightly higher in chicks hatched from eggs produced at 40 than 32 weeks of age

(97.25and 95.50%, respectively). The difference was found during the first rearing interval from 0-4 weeks (98.25 vs 97.25. %). Such results are in agreement with those obtained by El-turkey (1981) and Mahmoud (2003).

Carcass traits:

Effect of strain:

Table (8) show that strain had significant (P<0.01) effect on carcass weight (eviscerated bird), edible giblets (heart, liver and gizzard) and dressing percentages (carcass and edible giblets), being heavier H than R strain. This reflected in their weight relative to live body weight to be higher in H than R (72.3, 7.1 and 79.40%, respectively).

On the other hand, weight of non-edible components (blood and feather) was not affected significantly by strain. Their weight relative live body weight was nearly similar in H (4.5 and 6.3 %, respectively) than in R (4.9 and 7.1 %, respectively). This is in agreement with reports of several authors (Seemann, 1981; Ehinger, 1982; Mahapatra *et al.*, 1984 and Merkley and Lowe, 1988). However, the results of Becker *et al.* (1981); Mandlekar and Desmuckh (1983) and Alsobayel *et al.* (1989) are contrasted the present results.

Effect of age:

Weight of carcass, edible giblets and dressing as well as weight of blood and feather was not affected significantly by age of breeder-produced eggs, being heavier in chicks hatched from eggs produced at 32 or 40 weeks of age. This reflected in nearly similarity in their weight relative to live body weight.

The effect of interaction between strain and age on weight of carcass, edible and non-edible ovals was not significant (Table 8).

Table (8): Effect of strain and age of breeders on weight (g) and percentages of addible and non-addible organs.

Item	n	Carcass*		Giblets**		Dressing		Blood		Feather	
		wt X ± S.E	%	wt. X ± S.E	%	Wt X ± S.E	%	wt X ± S.E	%	wt. X ± S.E	%
Effect of chicken strain:											
H	20	1558.4^{A}±34.9	72.3	153.8^{A}±4.4	7.1	1712.2^{A}±38.5	79.4	97.0±.32	4.5	128.9±.31	6.3
R	20	1371.1^{B}±35.7	65.1	132.8^{B}±4.6	6.3	1504.0^{B}±39.8	71.4	110.1±.33	4.9	154.1±.32	7.1
Effect of chicken age (wks):											
32	20	1458.7±35.7	67.9	142.1±3.1	6.6	1600.8±39.8	74.6	100.9±.45	4.7	139.9±.33	6.73
40	20	1476.3±34.5	69.4	145.2±3.8	6.8	1621.5±38.9	76.2	105.6±.55	4.7	142.2±.45	6.57
Effect of interaction⊗ (Age x strain)											
32 H	10	1541.7±48.8	71.6	150.2±3.6	7.0	1691.9±45.4	78.5	91.0±1.23	4.3	127.9±1.2	6.4
40 H	10	1575.1±48.8	73.0	157.5±6.2	7.3	1732.6±58.2	80.3	103.1±1.25	4.7	129.9±.45	6.1
32 R	10	1363.9±52.1	64.4	132.8±6.6	6.2	1496.7±55.2	70.6	112.3±2.30	5.1	153.5±.43	7.1
40 R	10	1377.5±48.7	65.8	132.9±6.2	6.3	1510.4±45.4	72.1	108.1±2.35	4.7	154.5±.12	7.0

A and B: Means denoted within the same column with different superscripts for strain or age effect are significantly different at (P<0.05).

* Slaughtered and eviscerated birds ** Included heart, gizzard and liver

Economic efficiency:

The total cost of feed consumed and the total revenue of meat production as affected by strain and breeder ages are shown in Table (9). It is of interest to note that total cost of feed was higher for H than R strain and for chicks hatched from eggs produced at 40 than 32 weeks of age.

Such increase in H and eggs at 40 weeks of age was associated with higher average total wight, which reflected in increasing total return and net return and in turn higher economic feed efficiency for H strain than those for R strain at 32 weeks of age. From the economic point of view, it was found that H chicks hatched from eggs produced at 40 weeks of age recorded the highest economic feed efficiency (217.24%).

Table (9): Economic efficiency (E . E) of chicks as affected by strain and broiler breeder age.

Item	No of chicks/ group	Total* cost of feed (L.E)	Total weight gain (kg)	Total** return (L.E)	Net return (L.E)	E .E (%)
Effect of strain of chicks:						
H	319	1010.55	339.46	2138.6	1128.05	211.63
R	296	940.46	282.53	1779.97	839.51	189.27
Effect of breeder age: (week)						
32	312	976.94	298.12	1878.16	901.22	192.25
40	303	982.61	322.70	2033.01	1050.40	206.89
Effect of interaction: (Strain x age)						
32 H	162	1001.68	327.40	2062.62	1060.94	205.92
40 H	157	1019.42	351.52	2214.58	1195.16	217.24
32 R	150	940.12	270.15	1701.95	761.83	181.04
40 R	146	940.79	294.92	1857.99	917.21	197.49

* Total cost included price of feeds during the period after hatching up to 7 weeks of age.
** Total return was calculated as a total weight gain x price of market price per each kg.
Feed price was 1.45 L.E / kg feed, Chick breeder and meat revenue was based on a price of 6.30 L.E kg live body weight.

REFERENCES

Alsobayel, A. A., (1990). Effect of protein rearing diet and age on fertility and hatchability parameters of Saudi Arabian Baladi. Accepted for puplication in the J. King Saud Univ. Vol. 31 Agric. Sci. (2), 10/6/1990.

Alsobayel, A. A., F. M. Attia and M. S. Bayoumi, (1989) . The effect of early feed restriction on subsequent performance of two commercial broiler strains. Arabgulf J. Scient. Res., 7 (3), pp. 75 – 87..

Aly , F. A., (2000). Epidermal growth factor and insulin cause normal chicken heart mesenchymal cells to proliferate like their Rous sarcoma virus-infected counterparts. Proc. Natl. Acad.Sci . 79: 1154 – 1157 .

Becker,W.A., J.V. Spencer,L.W.Mirosh and J. A. verstrate, (1981). Abdominal and carcass fat in five broiler strains. Poultry Sci.,60:693 – 697.

Breslavets, V. A.; L. V. Kulikov, and A. A. Kasem (1997). The effect of egg weight and age on hatchability of fowls. Animal Breeding Abstract ., 65 No 6: 452.

Cahaner, A., z. Nitsan and I . Nir, (1986) . Weight and fat content of adipose and nonadipose tissues in broilers selected for or against abdominal adipose tissue . Poultry Sci. 65 : 215 – 222.

Chambers, J. R., J. S. Gavora and A. Fortin, (1981). Genetic changes in meat-type chickens in the last twenty years. Canadian Journal of Animal Science, 61, (3), 555 – 563.

Chen, T. C., S. Omar , D. Schultz, B. C. Dilworth, and E. J. Day, (1987). Processing, parts and deboning yields of four ages of broilers . Poultry Sci., 66 : 1334 – 1340.

Cherry, J. A.; Ghitelman, M. Z. and P. B. Siegel, (1978). The relationship between died and dwarfism in diverse genetic background on egg parameters. Poultry Sci. 57: 171 – 179.

Christensen, V. L.; Mather, M. and Laughlin, K. F. (1979). Storage of hatching eggs: The interaction between parental age and early embryonic development. Br. Poultry. Sci., 20: 595 – 604.

Ehinger, F., (1982) . Effect of feed, age and sex on fattening performance and carcass quality in broiler of different strain. I. Fattening and carcass results. Archiv fur Geflugelkunde 46 (3) 97 – 104.

Eid, S. M. (1979). The effect of egg characteristics and strain differences on embryonic and post-embryonic growth in the chickens. M. Sc. Thesis, Fac. Of Agric. Alexandria. University.

El- Turkey Afaf, I. (1981). Hybird vigor potencey ratio in performance of cross breds from four local breeds of chickens. M. Sc. Thesis. Alexandria. University.

El -Wardany. A. M.; Goher, L. M. and Enab, A. A. (1994). Effect of breed, laying period and selection for egg weight and egg quality in two local breeds of chickens. Egypt. Poultry Sci. , 14: 23 -49.

El-Attar, A. H. I. And El-Zainy M., (1983) . Carcass characteristics and meat composition of dwarf and normal cocks . Egypt. Poult. Sci. (3):71 – 86 .

Goher, L. M. ; El-Wardany, A. M. and Enab, A. A. (1994) . Direct and correlated responses of egg production performance under selection for egg weight in some local breeds of chickens. Egypt. Poultry Sci., 14: 1 – 22.

Gunningham, F. E.; Cotterill, O. J. And Funk, E. M. (1960). The effect of season and age of bird on egg size, quality and yield. Poultry. Sci., 39: 289 – 299.

Hataba, N. A., (1980) . Heterosis within foyoumi chickens. M. Sc, Thesis, Ain Shams Univ., Cairo.

Horn , P., L. Papacsi , I . Csalava and G. Glattfelder , (1980) . The influence of hatching egg size , age of the parrents and sex of the broiler on subsequent performance during rearing . World‹s Poultry Science. Association , 1 – 8 .

Khalifah, M. M., M. M. Ali, M. F. Shawer and A. z. Khalil, (1981). The effect of breed, diet, housing and lighting on performance and feed efficiency of broiler chickens. J. Agric. Sci. Mansoura Univ. 6: 29– 52.

Keshri, R . C. , G . Shyamsunder, S . S . Verma , B . P. Singh, A . K . Devroy , P . Sharma and S . P . Sinha, (1982) . Influence of strains and sex on live weight and meat yields in four purebred broiler strains . Indian Journal of Poultry Science 17 (2) 149 – 152 .

Keshri, R . C. , S . S . Verma , S . P . Sinha, R . P . Sharma , B . P . Singh, A . K . D . Roy and G . Shyamsunder, (1985) . The relationship between live weight and evisceration yield in purebred broiler strains . Indian Journal of Poultry Science 20 (4) 297 – 299 .

Lapao, C. ; Gama, L . T . and Chavereio Soares , M . (1999) . Effect of broiler breeder age and length of egg storage on albumen characteristics and hatchability : Poultry . Sci ., 78 : 640 – 645 .

Leclercq, B., J. C. Blum and J. P. Boyer, (1980) . Selecting broilers for low or high abdominal fat: Initial observations. Br. Poultry Sci., 21: 107 – 113.

Mahapatra, C. M., N. K. Pandey and S. S. Verma, (1984). Effect of diet, strain and sex on the carcass yield and meat quality of broilers. Indian Journal of Poultry Science 19 (4) 236 – 240.

Malone, G. W. and G. W. Chaloupka, (1979) . Evaluation of five commercial broiler crosses. I. Grow - out performance. Poultry Sie., 58: 509 – 515.

Mandlekar, S. M. and S. N. Desmukh , (1983) . Relationship between 8-week body weight and evescirated weight in broiler chickens. avian Research 67 (3) 96 – 100.

Marks , H. L. , (1980) . Growth, feed intake and feed conversion of dwarf and nondwarf broiler-type chickens. Poultry Sie., 59 : 2183 – 2188.

Mahmoud, T. H.; Madkour, Y. H.; Sayed, I. F. and Harirah, K. H. (1974a). Matrouh, A new breed of chickens. Ageic. Res. Rev. Vol. 52 no. 6; 87

Mahmoud, T. H.; Sayed, I. F. and Madkoyr, Y. H. (1974 b). The silver Montazah, A new variety of chickens. Agric. Res. Rev. Vol. 52, No. 6: 97 – 105.

Mahmoud, T. H.; N. bdel-Salam, J. E. Abd El-Hameid; A. I. El-Turky and Y. Abd-El-Kder, (1980). Effect of feeding excessive amount of potassium iodide on the performance of laying hens. 3 - Egg fertility and hatchability. Agric., Res. Rev. 233 – 238.

Mahmoud, T. H.; M. A. Kosba; M. F. Shawer; A. Z. Khalil and J. E. Abd El-Hameid, (1981). Effect of selection for body weight on certain economic traits in the fowl. 2- Growth and viability. Agric. Res. Rev .

Mahmoud, R . M . (2003) . A study on some factors affecting hatchability and fertility percentages and their relation with some productive traits in Gimmizah and Mamourah strains.

Marks, H. L. (1980). Growth rate and feed intake of selected and non-selected broiler. Growth, 43 : 80 – 90 .

McDaniel , G . R ., J. Brake and R . D . Bushong , (1979) . Relationship of feed restriction and reproductive traits in broiler breeders . Poultry Sci., 58 : 1080 .(Abstr.).

Meijerhof, R., (1994) . Theoretical and Empirical studies on temperature and Moisture Loss of Hatching Eggs during the Pre-Incubation period. Ph. D. dissertation. Universal of Wageningen, The Netherlands.

Merkley, J. W. and P. C. Lowe, (1988) . Association of rate-of-feathering genotypes in broiler with production and carcass composition traits. 2. Effect of genotypes and diet on processing traits and lipid deposition. Poultry Sci., 67: 914 – 919.

Milosevic, N.; B. Supic and L. Ukropin (1997) . Effect of egg storage duration on hatchability nd chick quality. A.B.A., 65: 1071.

Mohamed, E .T. (1988) . Comparative study of thyroid activity of native and foreign breeds of chicken. M. Sci. Thesis, Fac. of Veterinary Medicine, Cairo Univ., Egypt.

Mt-Losevic, N.; Supic, B. and Ukropina, L. (1997) . Effect of egg storage duration on hatchability and chick quality. A .B .A., 65: 1071.

Negm, H. M.; Abd EL-Ghany, A. I.; Abdel–Salam, F. E. and Darwish, M. (1978). The protein requirement of replacement pullets as affect by strains. Agric. Res. Rev., Cario Vol . 56, (No. 6): 53 – 61.

NRC (1994) . National Research Council National Requirements of Poultry . 9^{th} Rev. ed., National Academy Press; Washington , DC.

Pandey , N . K . , C . M . Mahapatra , R . C . Goyal and S . S . Verma , (1985) .Carcass yields , quality and meat composition of broiler chicken as influenced by strain , sex and age . Indian Journal of Animal Sciences , 55 (5) 371 – 380 .

Proudfoot , F. G. and H. W. Hulan , (1987) . Parental effects on performance of broiler chicken progenies. Poultry Sci., 66: 1119 – 1122.

Proudfoot, F. G., H. W. Hulan and K. B. McRae, (1982) . Effect of hatching egg size from semi-dwarf and normal maternal meat parent genotypes on the performance of broiler chickens. Poultry Sci., 61: 655 – 660.

Reis, I. H.; Gama, L. T. and Soares, M. C. (1997) . Effect of short storage conditions and broiler breeder age on hatchability, hatching time and chick weights. A. B. A. 66: 5198.

Rizkalla, H. E. (1996) . Evaluation of some local breeds for the physiological characteristics related to productive efficiency. Ph. D. Thesis, Faculty of Agriculture, Zagazig Univ., Benha Branch, Egypt.

Seemann , G., (1981) . The influence of age, sex and strain on yield and cutting of broilers. In quality of poultry meat. Beekbergen, Netherlands ; Spelderholt Institute for Poultry Research 21 – 27.

Shawer, M. F., M. A. Kosba and M. M. Khalifah, (1976) . Genetic and phenotypic correlation between 8 – weeks body weight and each of age at sexual maturity and egg number in the first ninety days in favor population of fowl. J. Agric. Sci. Mansoura Univ. 1: 114 – 125.

Shanawany, M. M. (1982) . Inter- Relationship between egg weight, parental age and embryonic development. Brit. Poult. Sci. 24:449– 455.

Shebl , M. K. ; (1980) . Genetical analysis for duration of fertility in two strains of chickens. M. Sc. Thesis, Alexandria. Univ.

Suarez., M. E.; Wilson, H. R.; Mather, F. B.; Wilcox, C. J. and Mcperson, B. N. (1997) . Effect of strain and age of the broiler breeder female on incubation time and chick weight. Poultry Sci., 76: 1029 – 1036.

Susan Kirk, G.; Emmans, C.; McCdonald, R. and Arnot, D. (1980) . Factors affecting the hatchability of eggs from broiler breeders. British. Poultry. Sci. 21: 37 – 53.

Ulaganathan , V ., V . Sethumadhavan , K . R . Reddy and V . S . Jayaraman , (1982) . Performance of five broiler strains on wire floor and deep litter floor . Cheiron , 11 , 1 , 11 – 14 . (Abstr,) .

Wiley , W . I I ., (1950) . The influence of egg weight on the prehatching and pos-hatching growth rate in fowl . I I . Egg weight-chick weight ratios . Poultry Sci . (29) : 595 – 605 .

Yannakopoulos , A . L . and A . S . Tserveni – Gousi , (1987) . Relationship of parents , age , hatching egg weight and shell quality to day – old chick weight as influenced by oviposition time . Poultry Sci .,(66): 829 – 833.

Yamani, K. A. O., M. E. Nowar, I. F. M. Marai A. M. Irky and M. S. Eid, (1978) . Some purebred, Crossbred and backcross fed conventional and improved diet of winter and spring hatches for broiler production in Egypt. Egyptian Journal of Animal Production 18: 2, 169 – 175.

تأثير السلالة وعمر الآباء على إنتاجية كتاكيت اللحم

رمضان مغاوري علي

معهد بحوثِ الإنتاج الحيواني، مركز البحوث الزراعيةِ، وزارة الزراعة، مصر

استخدم في هذا البحث ٤٠٠ بيضة لكل سلالة وضعت في الأسبوع ٣٢ و٤٠ مِنْ العُمر وُقستْ لكُلّ من سلالة الهبرد والروس في نفس المفرخة. وأثناء أوقات مختلفةِ مِنْ فترة التحضين قدرت الخصوبة والنفوق الجنيني وسُجّلَ معدل النفقس ورُبّيتْ كل الكتاكيت الفاقسة تحت ظروف رعاية وتغذية متماثلةِ. وفي عمر ٧ أسابيع مِنْ العُمر، تم ذبح ١٠ طيور مِنْ كُلّ سلالة عند كُلّ عُمر إنتاج بيض لتَقييم خصائص الذبيحة. كذلك تم حساب كفاءة الغذاء الاقتصادية. وقد أظهرت النتائج ما يلي:

١- كان كل من: وزن البيض (٥٤,٩٤ مقابل ٥٦,٦٨ جم)، معدل الخصوبة (٩١,٧٥ مقابل ٩٤,٣ %) ومعدل الفقس (٨٠,٦٥ مقابل ٨٤,٦ %) أعلى معنويا لسلالة الهبرد عن الروس.

٢- كان وزن البيض الناتج عند عمر ٤٠ أسبوع كانَ أعلى معنويا من البيض الناتج عند عمر ٣٢ أسبوع (٥٣,٧٢ مقابل ٥٧,٩ جم)، وكانَ معدل الخصوبة والفقس للبيض الناتج عند عمر ٣٢ أعلى معنويا عن البيض الناتج عند عمر أسبوع ٩٢,٥ و٨١,٨٦ % مقابل ٩٢,٥ و٨٣,٣٩ %، على التوالي).

٣- كان معل النفوق الجنيني في الفترات ٠-٧، ١٨-٢١ و٠-٢١ يوم مِنْ فترة التحضين أعلى معنويا في الروس (٥,١٧، ٤,٦٣ و١٩,٣٦ %) مِنْ الهبرد (٣,٧١، ٣,٤٥ و١٥,٣٩ %)، على التوالي، بينما لم يتأثر معدل النفوق الجنيني بالإضافة إلى الشذوذِ الكليّ في الفترات ٧-١٤ و١٤-١٨ يوم. % بشكل ملحوظ بالسلالةِ.

٤- كان معل النفوق الجنيني في الفترات ٠-٧ و٠-٢١ يوم مِنْ التحضين أعلى معنويا للبيض الناتج عند عمر٣٢ أسبوع (١٦,٦١ و٥,٣٦ %) عنْ عمر٤٠ أسبوع مِنْ العُمر (١٨,١٤ و٣,٥٣ %)، على التوالي، بينما لمْ يَختلفْ معدل النفوق الجنيني بالإضافة إلى الشذوذِ الكليّ بشكل ملحوظ أثناء الفترات ٧-١٤، ١٤-١٨ و١٨-٢١ يوم من التحضين بين أعمار وضع البيض.

٥- كان وزن الكتاكيت أثقلَ في الهبرد مِنْ الروس عند الفقس (معنويا) وعند عمر ٢، ٤، ٦ و٧ أسابيع (معنويا).

٦- كان وزن الكتاكيت أثقلَ عند الفقس (٤٣,٤٥ مقابل ٤٥,٩٨ جم معنويا)، ٢، ٤، ٦ (معنويا) و٧ (معنويا) أسابيع مِنْ العُمر للبيض الناتج عند عمر ٤٠ عن ٣٢ أسبوع مِنْ العُمر.

٧- لمْ يتأثرْ متوسط الزيادة الكليّة في الوزن ومتوسط الزيادة النسبية للكتاكيت في الفترة ٠-٤ أسبوع بالسلالة. بينما كان متوسط الزيادة الكليّة في الفترات ٤-٧ و ٠-٧ أسبوع مِنْ العُمر بالإضافة إلى متوسط الزيادة النسبية للكتاكيت في الفترة ٤-٧ أسبوع أعلى معنويا في الهبرد عن الروس.

٨- تأثر متوسط الزيادة الكليّة في الوزن في الفترات ٤-٧ و ٠-٧ أسبوع و متوسط الزيادة النسبية للكتاكيت في الفترة ٤-٧ أسبوع مِنْ العُمر معنويا بعمر وضع البيض.

٩- زادتْ كمية الغذاء المأكول في كل الفتراتِ في الروس عنْ الهبرد، وكان معدل تحويل الغذاء أفضلَ معنويا في الهبرد عن الروس في كل فتراتِ العُمر.

١٠-زادتْ كمية الغذاء المأكول في كل الفتراتِ للكتاكيت التي فقستْ مِنْ البيض الناتج عند عمر ٣٢ عنْ ٤٠ أسبوع.

١١- قيَم معدل التحويل الغذائي لمْ تُختلفْ بشكل ملحوظ في الفترات ٠-٤ و ٤-٧ أسبوع .

١٢-كان معدل الحيوية أعلى في الهبرد عن الروس في الفترة ٠-٤، ٤-٧ (٩٠,٢٦ مقابل ٩١,٣٢ %) و٠-٧ أسابيع مِنْ العُمر وكَانَ أعلى في الكتاكيت آلتي فقستَ مِنْ البيض الناتج عند عمر ٤٠ عنْ ٣٢ أسبوع فى الفترة ٠-٤ أسابيع من العمر (٩٠,٠٦ مقابل ٩٠,٤٣ %).

١٣- أوزان الجسم مِنْزُوعة الأحشاء، الأحشاء والجزاء القابلة للأكل كانت أثقل في الهبرد عن الروس. وكان وزنهم نسبة إلى وزنَ الجسم الحيِّ أعلى في الهبرد عنْ الروس (٧٢,٢٨، ٧,١٣ و ٧٩,٤٠ %، على التوالي).

١٤-لم يتأثر وزن المكونّاتِ غير الصالحة للأكل بشكل ملحوظ بالسلالةِ. وكان وزنهم نسبة إلى وزنَ الجسم الحيِّ مماثلَ تقريبا في الهبرد (٤,٥٢ و٦,٢٥ %، على التوالي) عنْ الروس (٤,٨٨ و٦,٤٤ %، على التوالي).

١٥- كانت الفروق في وزن الذبيحة، الأحشاء الصالحة والغير صالحة للأكل وبسبة التصافي وكذلك وزنهم نسبة إلى وزنَ الجسم الحيِّ غير معنوية في الكتاكيت التي فقستَ مِنْ البيض الناتج في عمر٣٢ عنْ ٤٠ أسبوع.

١٦-مِنْ وجهة النظر الاقتصادية، وُجِدَ أن كتاكيت الهبرد التي فقستْ مِنْ البيض الناتج في عمر ٤٠ أسبوع سجّلت أعلىْ كفاءةَ اقتصادية للغذاء (٢١٧,٢٤ %).